

DEFENDANTS' MOTION FOR SUMMARY JUDGMENT—EXHIBIT 1  
WILLIAM CARDEN EXPERT REPORT (JAN. 24, 2018)

EXCERPTED—THIS CONTAINS ONLY THE SUBSTANCE OF HIS REPORT. IT DOES  
NOT CONTAIN HIS CV, HIS LIST OF PUBLICATIONS, OR ALL OF THE EXHIBITS  
THAT WERE PROVIDED WITH THE REPORT

# McSWAIN ENGINEERING, INC.

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FAX (850) 484-0508

## Materials Engineering Report

**January 24, 2018**

Reference: Clarence Edward Whitaker, etc. v.  
Hyundai Motor Company, et al.

Subject Vehicle: 2007 Hyundai Santa Fe,  
VIN 5NMSH13E57H041555

Incident Date: October 16, 2015

Incident Location: Pulaski County, Virginia

Injuries: 1 Fatal

### **1.0 Requested Analysis**

McSwain Engineering, Inc. was requested to perform a materials failure analysis and engineering investigation of the incident involving a 2007 Hyundai Santa Fe, VIN 5NMSH13E57H041555.

McSwain Engineering, Inc. is a consulting engineering firm with capabilities in materials engineering, mechanical engineering, and forensic chemistry, and has state-of-the-art equipment particularly suited to the science of failure analysis and engineering investigation. These capabilities specifically include optical and scanning electron microscopy; physical, dimensional, chemical and mechanical property evaluation; digital radiography and computed tomography; and comprehensive photographic documentation capability. McSwain Engineering, Inc. utilizes standard methodology and generally-accepted techniques in performing a failure analysis and incorporates internal peer review throughout the failure analysis process.

I am a Consulting Materials Engineer and the Director of Materials Engineering at McSwain Engineering, Inc. in Pensacola, Florida.

I earned a Bachelor of Science in Materials Engineering from The University of Alabama at Birmingham and a Master of Science in Materials Engineering from The Ohio State University. My graduate research concentrated on mechanical metallurgy of metal forming and stamping. My research and testing investigated the processing and utilization of new weight saving materials in the automotive industry including aluminum sheet and high strength steel for body panels and other stamped components.

While pursuing my undergraduate and graduate research, I performed failure analysis, metallurgical analysis, and testing for litigation and industrial clients.

Beyond my Bachelor of Science in Materials Engineering and Master of Science in Materials Engineering, I have additional education, experience, and training in vehicle and aircraft accident investigation/reconstruction; wheel and tire performance and tire forensic analysis; internal combustion engines; and other failure analysis/investigation topics.

I am currently a registered professional engineer in the states of Florida, Alabama, and Georgia by experience, education, and examination in metallurgical engineering.

I have been a degreed materials engineer since 1994, and a registered professional engineer since 2003 by meeting the education, experience, examination, and continuing education requirements necessary for retaining this registration.

I have 20 years of experience analyzing, characterizing, and testing materials, including metals, polymers, and composites. I have performed engineering research and development related to the manufacturing of automobile and aircraft components.

I joined McSwain Engineering in 2006, where I have continued to perform failure analysis and materials engineering investigation of aircraft crashes, automotive accidents, industrial failures, and other consumer product failures. I have been qualified as a testifying expert and provided expert testimony in deposition and trial in

numerous state and federal cases and my opinions have not been excluded.

This is a report of findings and opinions to date in this investigation.

## **2.0 Incident Background**

The subject incident, which involved a 2007 Hyundai Santa Fe, VIN 5NMSH13E57H041555, occurred at 512 Floyd Avenue, Pulaski, Virginia on October 16, 2015.

During the incident event, the subject 2007 Hyundai Santa Fe began to roll as, or after, the driver (Shannon Whitaker) exited the car. The subject vehicle collided with the exterior wall of driver's home, pinning the driver between the vehicle and the exterior wall of the home. The subject 2007 Hyundai Santa Fe is shown in Enclosure 1 in the post-incident/as-received condition. The vehicle identification number (VIN) is shown in Enclosure 2. Damage to the driver side door, front quarter panel, and front bumper is shown in Enclosure 3. The driver of the 2007 Hyundai Santa Fe sustained fatal injuries during the incident.

Keys of the subject 2007 Hyundai Santa Fe were not in the ignition at the time of the incident. The front passenger door was found locked and the vehicle's transmission gear selector was found in the DRIVE position immediately following the incident (DR 001-008, Accident Information to Include Emergency Medical Services Report, Medical Examiner Report).

Review of case documents revealed the following timeline regarding the history of the subject vehicle (DR 001-010, Car Information Includes Car Fax, Guaranteed Asset Protection Addendum):

2007 Feb 19	Subject Vehicle shipped to First Team, Inc. in VA from Hyundai Motor America
2007 Jun 09	Subject Vehicle sold to first owner
2007 Aug 13	Subject Vehicle console repaired by First Team, Inc.
2008 Oct 08	Hyundai Motor America issued service bulletin NHTSA #08E055000 for trailer hitch

wiring harness. Moisture can corrode components on circuit board on top surface of rear bumper reinforcement, causing short circuit.

2009 Feb 25	Maintenance inspection, including armrest and seatbelt buckle replacement, completed by First Team, Inc.
2012 Jul 31	Maintenance inspection completed and airbag clockspring/reel replaced by First Team, Inc. at 44,712 miles
2014 Jun 30	Vehicle sold to second owner
2014 Jul 01	Maintenance inspection completed, oil/filter changed, front and rear brake rotors resurfaced by Haley Toyota of Roanoke, VA, at 59,910
2015 Mar 04	Vehicle offered for sale at 66,762 miles by Duncan Hyundai in Christiansburg, VA
2015 Mar 24	Vehicle purchased by third owner (Whitaker)
2015 Aug 24	Accident reported - right side impact with another vehicle, airbags did not deploy
2015 Aug 27	Hyundai Motor America issued service bulletin, recall #936 for valve cover oil leak repair

### **3.0 Field Inspections of Subject Vehicle**

Inspections of the subject 2007 Hyundai Santa Fe were performed at Clarke Automotive Consultants and Buckingham Automotive in Atlanta, Georgia, on October 25 and 26, 2017. The subject 2007 Hyundai Santa Fe was transported from Clarke Automotive Consultants by flatbed truck to Buckingham Automotive. Examination and photodocumentation of the subject 2007 Hyundai Santa Fe was performed during these inspections.

#### **3.1 Subject 2007 Hyundai Santa Fe Ignition Switch and Transmission Gear Shift Selector**

Defense experts examined the subject 2007 Hyundai Santa Fe and operated the ignition switch and transmission gear shift selector without the battery being connected.

Attempts were made to remove the subject key from the ignition switch. This was evaluated at the OFF (LOCK), Accessory (ACC), and RUN (ON) key positions for each of the transmission gear shift selector locations. The subject key could not be removed from the ignition switch in the ACC and RUN (ON) key positions for each of the transmission gear shift selector locations. However, the key could be removed in the OFF (LOCK) position at each of the transmission gear shift selector locations. Normally the key should not be capable of being removed in a shifter position other than PARK. The evaluation was repeated with a battery supplying power to the vehicle and again with the vehicle started. These evaluations produced the same results, as shown in Enclosure 4. The key could be removed in the OFF (LOCK) position with the shifter in a position other than PARK.

During this inspection, the subject vehicle was able to be shifted out of PARK into REVERSE without the brake being depressed.

### **3.2 Subject 2007 Hyundai Santa Fe Ignition Lock Solenoid Connector**

Further observation of the subject 2007 Hyundai Santa Fe, VIN 5NMSH13E57H041555, revealed that an ignition lock solenoid connector that is a part of the shift interlock system was not connected. With the battery connected to the vehicle, the voltage across the connectors was measured. With the transmission gear shift selector in the PARK position, the voltage meter measured 0.0 volts. With the transmission gear shift selector biased out of the PARK position, the voltage meter measured 11.2 volts. Further evaluation was suspended until the vehicle could be transported to a laboratory for detailed examination of the vehicle components.

### **3.3 Subject 2007 Hyundai Santa Fe Aftermarket JVC Radio**

Inspection of the subject vehicle revealed that it had an aftermarket JVC KW-R910BT radio installed. The installation of the aftermarket JVC KW-R910BT radio has a microphone that was routed from the rear side of the radio, under the instrument panel and steering column, to the driver side A-pillar.



#### **4.0 Laboratory Analysis and Evaluations**

The subject vehicle was transported to McSwain Engineering, Inc. in Pensacola, Florida for a laboratory inspection conducted on January 10 and 11, 2018. During this inspection, the subject vehicle was examined and additional evaluations of the transmission gear shift assembly, the ignition switch, and the ignition lock solenoid connector were performed.

##### **4.1 Subject Gear Shifter and Ignition Switch Evaluations**

The subject transmission gear shifter and ignition switch were evaluated in the same manner as conducted in the prior inspections. Evaluation of the subject vehicle revealed that the key could be removed with the shifter in positions other than PARK with the ignition lock solenoid connector disconnected. Evaluations with the ignition lock solenoid connector engagement simulated (simulated by connecting the wires with alligator clips) revealed that the key could not be removed from the ignition in shifter positions other than PARK. In this condition, the ignition switch functioned as normal without the anomalous behavior of the prior evaluations. The results of all ignition switch evaluations are provided in Enclosure 4.

##### **4.2 Subject Ignition Lock Solenoid Connector**

The subject ignition lock solenoid connector was removed by clipping the wires from the steering column side and the shifter side of the connector ends. The subject ignition lock solenoid connector is shown in Enclosure 5 prior to removal. After removal, the following inspection and documentation was performed on the subject ignition lock solenoid connector:

- Visual examination and photography
- Stereomicroscopy
- Scanning Electron Microscopy (SEM)
- X-ray Energy Spectroscopy

Examination revealed that the subject ignition lock solenoid connector consisted of a male and a female plastic housing. Each housing contained metal wire terminals that serves to complete the electrical circuit. The female plastic housing contained blade-style wire terminals. The male plastic housing contained receptacle-style wire terminals that received the blades of the mating end and

made contact through three contact pads inside the receptacles.

During the examination, the subject ignition lock solenoid connector was disassembled in order to document and examine the metal connector blades and receptacles from their respective connector ends. The metal receptacles had gouges from prior electrical evaluations performed during the October 26, 2017 inspection. Examination of the connector blades of the subject ignition lock solenoid connector revealed that there were contact marks consistent with engagement in the mating receptors.

Exemplar ignition lock solenoid connectors were examined for comparison with the subject connector. The following laboratory examinations were performed on exemplar ignition lock solenoid connectors:

- Visual examination and photography
- Stereomicroscopy
- Scanning Electron Microscopy (SEM)
- X-ray Energy Dispersive Spectroscopy (EDS)
- Radiographic inspection
- X-ray computed tomography (CT scanning)
- Operational assessment

The contact areas on the subject blades were examined, documented and measured. Comparison with exemplar connectors in corresponding locations revealed that the contact areas on the subject connector blades were approximately 2.4 mm shorter, as shown in Enclosures 6 through 9. Exemplar examinations, analysis of CT data, and comparison with the subject connector indicate that the subject connector was not fully engaged in its locked position at the time the subject vehicle was manufactured, as shown in Enclosures 10 through 12.

The subject male connector housing had a locking lever arm that engaged the mating side holding it in place by a barb feature, as shown in Enclosure 13. Scratches and a gouge were observed on the surface in front of this lock feature. The molding seam adjacent to these features was still raised above the surface of the housing, as shown in Enclosure 14. The lock feature was intact and undamaged. The partial engagement of the connector allows the electrical continuity between the wiring, yet the connector can be separated without depressing the lock feature.



#### **4.3 Subject Transmission Gear Shift Assembly**

The following laboratory examinations were performed on the subject transmission gear shift assembly:

- Visual examination and photography
- Stereomicroscopy
- Fourier Transform Infrared Analysis (FTIR)
- Force measurement
- Operational assessment

Operational assessment of the subject transmission gear shift assembly confirmed prior observations that the shifter could be moved from PARK to REVERSE without the brake pedal being depressed. The force required for this movement was measured and recorded. The results of the force evaluation are provided in Enclosure 15.

Evaluation of the transmission gear shift assembly with the battery connected and the ignition lock solenoid wires connected with alligator clips revealed that the transmission gear shift solenoid functioned normally.

#### **4.4 Subject Transmission Gear Shift Assembly Locking Pawl**

The subject transmission gear shift assembly was examined and evaluated in the vehicle prior to removal. The subject transmission gear shift assembly has a locking pawl that limits the shift lever depending on the condition of the ignition key and the brake pedal. The pawl is actuated by a solenoid and a rubber cushion that acts as a spring to keep the pawl in position unless the solenoid is energized.

FTIR, SEM, and X-ray spectroscopy examination of the pawl revealed it to be constructed of glass fiber reinforced Nylon 6,6. Examination of the subject shift lever locking pawl revealed that the corner of the pawl that contacts the shift lever assembly was broken off. A small polymer fragment was observed and retrieved from the floor of the subject vehicle directly below the shifter, after the shifter was removed from the vehicle. This fragment was retrieved for further examination, as shown in Enclosure 16.

The small polymer fragment was examined and documented by photography, stereomicroscope, FTIR, SEM, and X-ray EDS analysis. These analyses revealed that the fragment is the

same size and shape of the missing corner of the subject locking pawl. Chemical and SEM analyses of the fragment revealed that it is made of glass fiber reinforced Nylon 6,6, the same as the locking pawl. This confirmed that the fragment was the missing piece of the locking pawl.

The stereomicroscopic and SEM examination on the fracture surface of the fragment revealed that it fractured in overload. Deformation and surface buckling adjacent to the fracture observed on the locking pawl is also consistent with overload fracture of the locking pawl.

The broken corner of the locking pawl allows the shifter to be shifted out of PARK without the brake being depressed. This renders the locking functionality of the pawl to be ineffective.

## **5.0 Discussion**

Review of case documents revealed that at the time of the incident that killed Mrs. Whitaker, the key was out of the ignition while the transmission shifter of the subject vehicle was in the DRIVE position. Additionally, post incident evaluation of the vehicle revealed that the key could be removed with the shifter in a position other than PARK. In addition, the shifter was able to be shifted from PARK to REVERSE without the brake being depressed.

Inspections and evaluations of the components of the transmission gear shift assembly, ignition switch, and ignition lock solenoid connector allowed for the diagnosis, explanation of incident scene conditions, and conclusions that follow. The subject ignition lock solenoid connector was not fully engaged and locked at the time the vehicle was manufactured. The subject ignition lock solenoid connector was partially engaged allowing normal operation of the ignition switch and transmission gear shifter even though the connector was never locked. Prior to the incident that resulted in the death of Mrs. Whitaker, the subject ignition lock solenoid connector became disengaged. This caused the mechanism in the ignition switch to allow the key to be removed in a shifter position other than PARK.

## **6.0 Summary of Relevant Facts & Conclusions**

The underlying facts and conclusions in the text, as well as those that are summarized in this section, have been reached to a reasonable degree of materials engineering certainty based on consideration of collision information, case documents, post-collision photo documentation, technical data, laboratory examination and analysis, and observations:

1. The subject incident, which involved a 2007 Hyundai Santa Fe, VIN 5NMSH13E57H041555, occurred at 512 Floyd Avenue, Pulaski, Virginia on October 16, 2015. During the incident event, the subject 2007 Hyundai Santa Fe collided with the exterior wall of the driver's home, pinning the driver between the vehicle and the exterior wall. During the incident event, the driver of the subject 2007 Hyundai Santa Fe sustained fatal injuries.

Basis: Incident Report and Laboratory Analysis

2. The subject key of the 2007 Hyundai Santa Fe was not in the ignition at the time of the incident.

Basis: Incident Report and Laboratory Analysis

3. The transmission gear shifter of the subject 2007 Hyundai Santa Fe, VIN 5NMSH13E57H041555 was found in the DRIVE position following the incident.

Basis: Incident Report and Laboratory Analysis

4. Laboratory examination of the subject 2007 Hyundai Santa Fe, VIN 5NMSH13E57H041555, revealed that the ignition lock solenoid connector, that is a part of the shift interlock system, was not connected.

Basis: Laboratory Analysis

5. The subject ignition lock solenoid connector was not fully engaged and locked at the time the subject vehicle was manufactured.

Basis: Laboratory Analysis

6. The subject ignition lock solenoid connector was partially engaged allowing normal operation of the ignition switch and shift mechanism even though the connector was never locked.

Basis: Laboratory Analysis

7. Prior to the incident that resulted in the death of Ms. Whitaker, the subject ignition lock solenoid connector became disengaged. This caused the mechanism in the ignition switch to allow the key to be removed in a shifter position other than PARK.

Basis: Laboratory Analysis

8. The subject ignition lock solenoid connector was never locked and became disengaged, causing the condition where the key could be removed from the ignition in a transmission shifter position other than PARK.

Basis: Incident Report and Laboratory Analysis

9. The subject transmission gear shift assembly has a locking pawl that limits the shift lever motion depending on the condition of the ignition key and the brake pedal. The broken corner of the locking pawl allows the shifter to be shifted out of PARK without the brake being depressed, rendering locking (motion limiting) function of the pawl ineffective.

Basis: Laboratory Analysis

## 7.0 Case Literature

See Appendix 1 for case file materials and data support for conclusions and opinions.

The findings of this engineering investigation have been documented, including documentation of the visual, dimensional, macroscopic, and microscopic features observed. It is intended the photographs, laboratory analysis data, and documents will be used to support the above opinions. Other photographic exhibits may also be selected for trial.

The above are findings and opinions of this investigation to date. I reserve the right to supplement these findings and opinions as new information becomes available. These are my primary opinions; however, sub-opinions and related opinions may be expressed during deposition questioning.

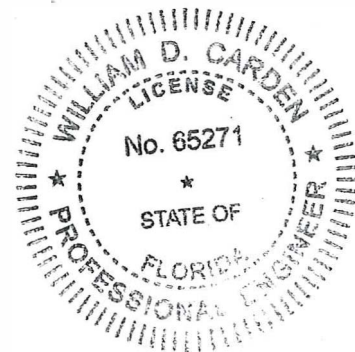
My curriculum vitae and testimony chronology are enclosed as attachments. My attached curriculum vitae includes qualifications and all publications authored and/or co-authored.

McSwain Engineering, Inc. charges \$300.00 per hour for my materials failure analysis and testimony in this case.

I have not prepared any trial exhibits at this time. I may use photographs, diagrams, and charts to explain my findings and opinions at trial.



William D. Carden, M.S., P.E.



## **MATERIALS ENGINEERING INVESTIGATION**

Case Number: M1390B/Lowe  
Case Style: Clarence Edward Whitaker, etc., v. Hyundai Motor Company, et al.

### **CASE LITERATURE**

1. Subject Vehicle Data, SANTAFE(CM)\_ABSESC\_170727-070830, Flash Drive
2. 2007 Hyundai Santa Fe Owner's Manual
3. Subject Vehicle Data, SANTAFE(CM)\_AT\_170727-071157, Flash Drive
4. Subject Vehicle Data, SANTAFE(CM)\_BCM\_170727-072028, Flash Drive
5. Subject Vehicle Data, SANTAFE(CM)\_ENGINE\_170727-070632, Flash Drive
6. Subject Vehicle Snapshots, Flash Drive
7. Subject Vehicle Inspection Photographs, Chip 1, Clarke Automotive Consultants, Disc, 27 Jul 17
8. Exemplar Steering Column Photographs, Clarke Automotive Consultants, Disc, 8 Aug 17
9. Accident Information to Include Emergency Medical Services Report, Medical Examiner Report, Google Search for Prescribed Pharmaceuticals, Pulaski Police Call for Service Record, Incident Report, Crime Scene Access Log, and Death Investigation Checklist, October 2015
10. Photographs of Accident Scene and Shannon Whitaker, October 2015
11. Car Information Includes Car Fax, Guaranteed Asset Protection Addendum, Vehicle Service Contract Application and Documents, Odometer Disclosure Statement, 24 Mar 15
12. Virginia Buyers Order and Retail Installment Sale Contract, March 2015
13. Federal Rules of Civil Procedure, Disclosure of Expert Testimony, Rule 26
14. Richard Clarke's Initial Inspection Videos of the Subject Ignition, Brake Shift, and Gear Shift Mechanism, P8230002 - P8230004, Disc



Clarence Edward Whitaker, etc. v. Hyundai Motor Company, et al.  
Subject 2007 Hyundai Santa Fe, VIN 5NMSH13E57H041555



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DP-0001



25 OCT 17  
DP-0003



25 OCT 17  
DP-0004

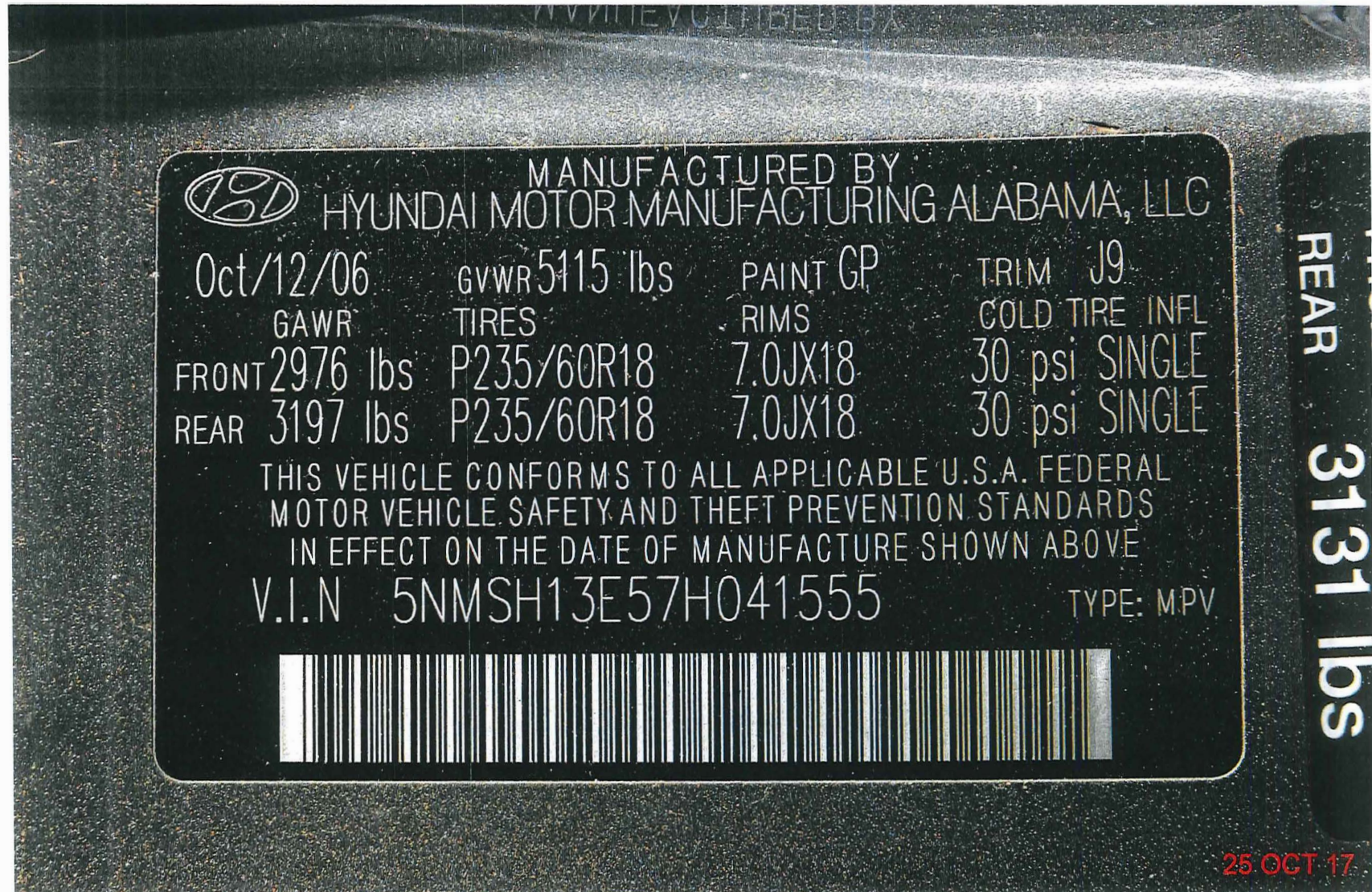


25 OCT 17  
DP-0006





Clarence Edward Whitaker, etc. v. Hyundai Motor Company, et al.  
Subject 2007 Hyundai Santa Fe, VIN 5NMSH13E57H041555



DP-0016





Clarence Edward Whitaker, etc. v. Hyundai Motor Company, et al.  
Subject 2007 Hyundai Santa Fe, VIN 5NMSH13E57H041555



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DP-0006



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DP-0008



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DP-0009



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DP-0010





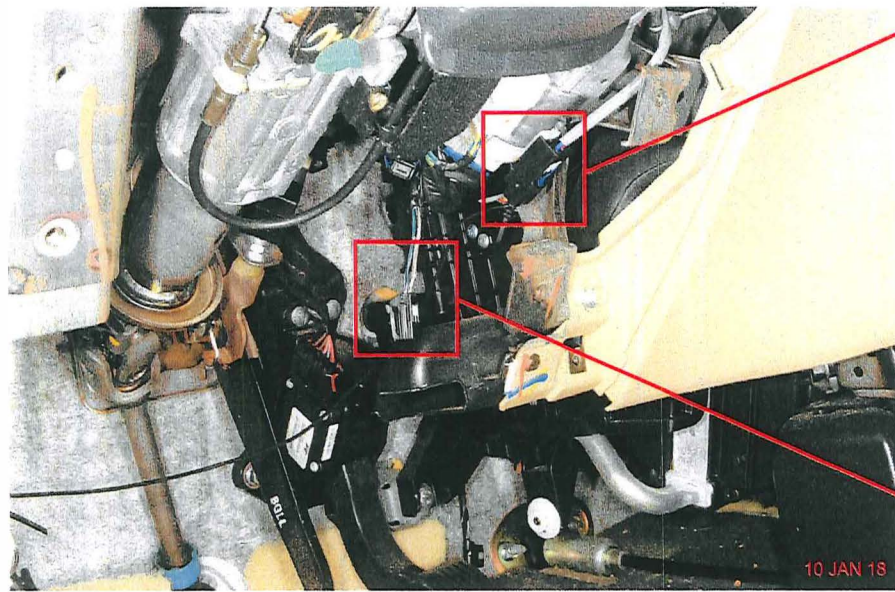
Clarence Edward Whitaker, etc. v. Hyundai Motor Company, et al.  
Subject Ignition Switch Evaluations

Shifter Position	Key Position	As-Inspected Oct 26, 2017		Connector Disengaged		Connector Engaged (Simulated)	
		Could Key Be Removed in the Following Conditions		Could Key Be Removed in the Following Conditions		Could Key Be Removed in the Following Conditions	
		Battery Disconnected	Battery Connected	Battery Connected		Battery Connected	
				Brake Off	Brake On	Brake Off	Brake On
PARK	RUN (ON)	No	No	No	No	No	No
PARK	ACC	No	No	No	No	No	No
PARK	OFF (LOCK)	Yes	Yes	Yes	Yes	Yes	Yes
REVERSE	RUN (ON)	No	No	No	No	No	No
REVERSE	ACC	No	No	No	No	No	No
REVERSE	OFF (LOCK)	Yes	Yes	Yes	Yes	No**	No**
NEUTRAL	RUN (ON)	No	No	No	No	No	No
NEUTRAL	ACC	No	No	No	No	No	No
NEUTRAL	OFF (LOCK)	Yes	Yes	Yes	Yes	No**	No**
DRIVE	RUN (ON)	No	No	No	No	No	No
DRIVE	ACC	No	No	No	No	No	No
DRIVE	OFF (LOCK)	Yes	Yes	Yes	Yes	No**	No**

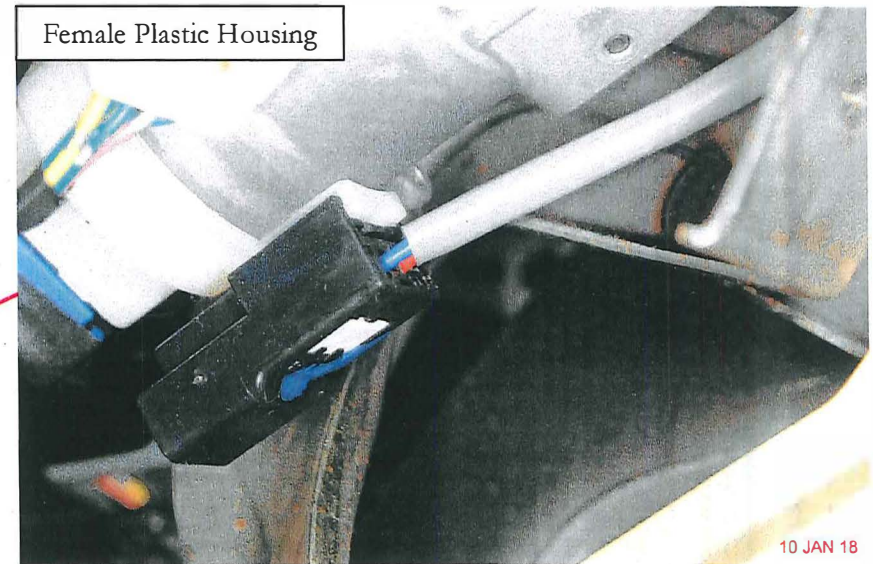
\*\* Key could not be rotated back to OFF (LOCK) position



Clarence Edward Whitaker, etc. v. Hyundai Motor Company, et al.  
Subject Ignition Lock Solenoid Connector

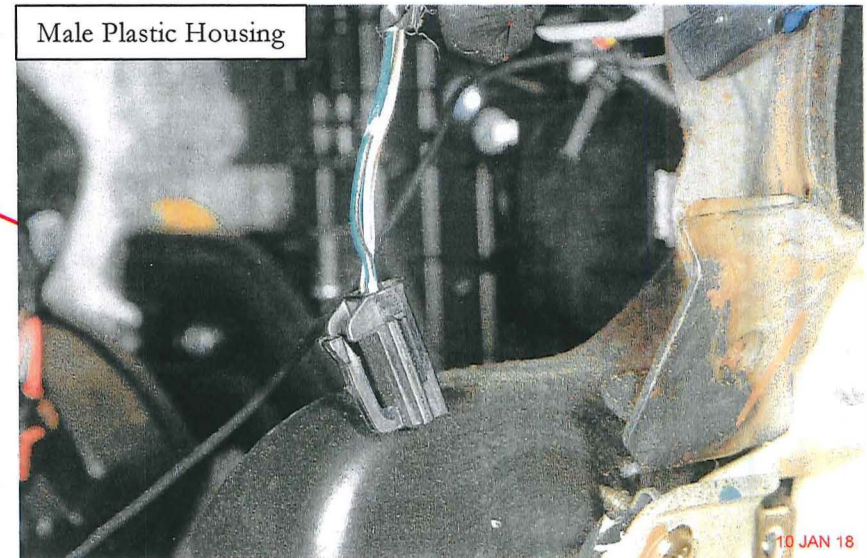


10 JAN 18  
DP-0421



Female Plastic Housing

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DP-0425



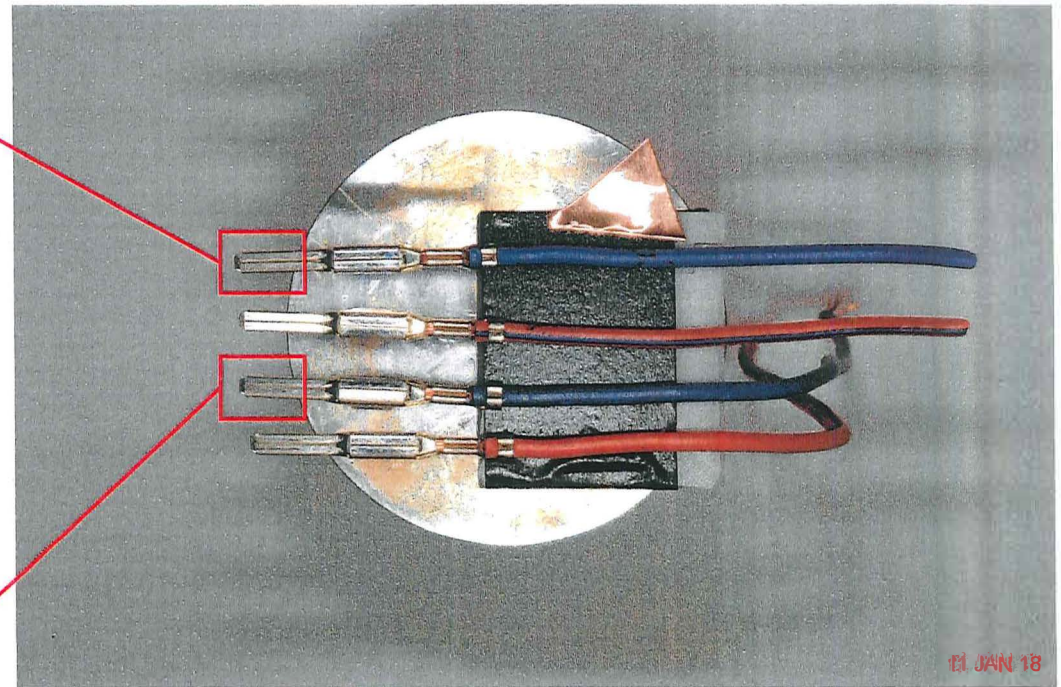
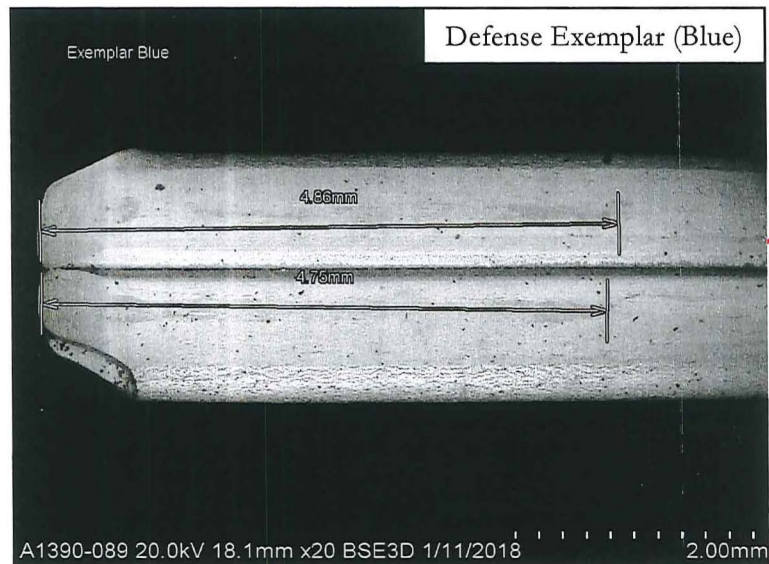
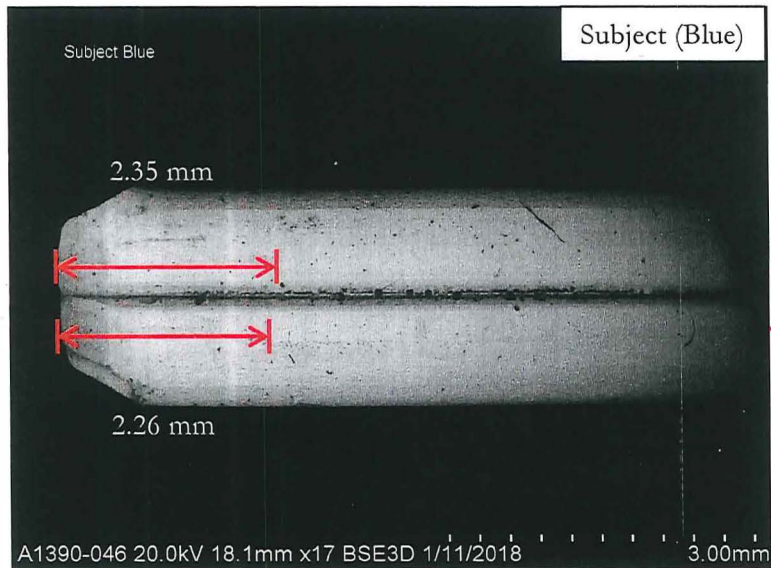
Male Plastic Housing

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DP-0426





Clarence Edward Whitaker, etc. v. Hyundai Motor Company, et al.  
Subject and Exemplar Ignition Lock Solenoid Connector Blades



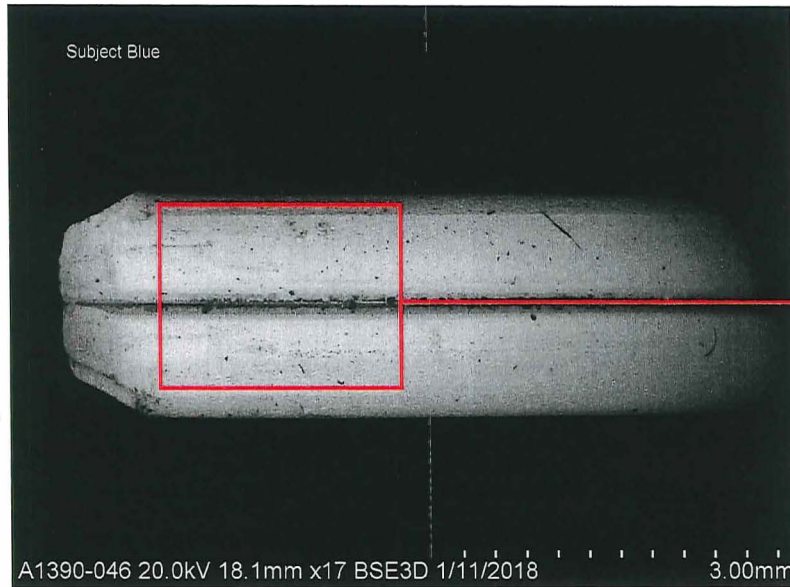
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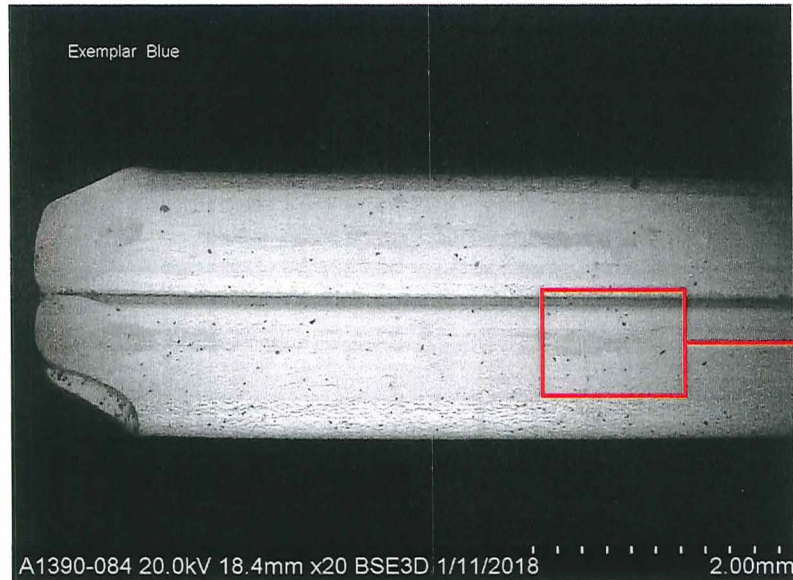


Clarence Edward Whitaker, etc. v. Hyundai Motor Company, et al.  
Subject and Exemplar Ignition Lock Solenoid Connector Blades

Subject  
Connector Blade  
(Blue)

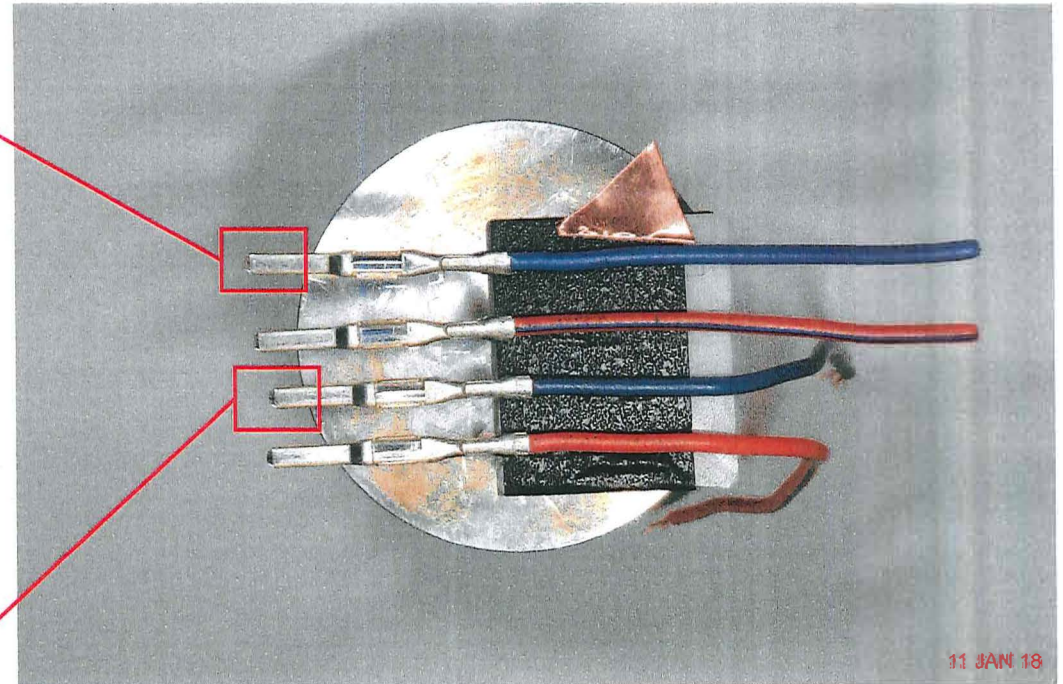
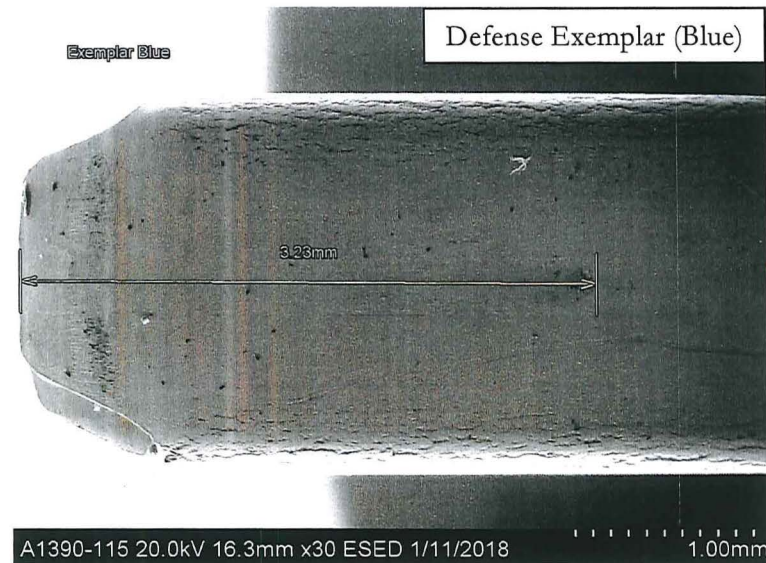
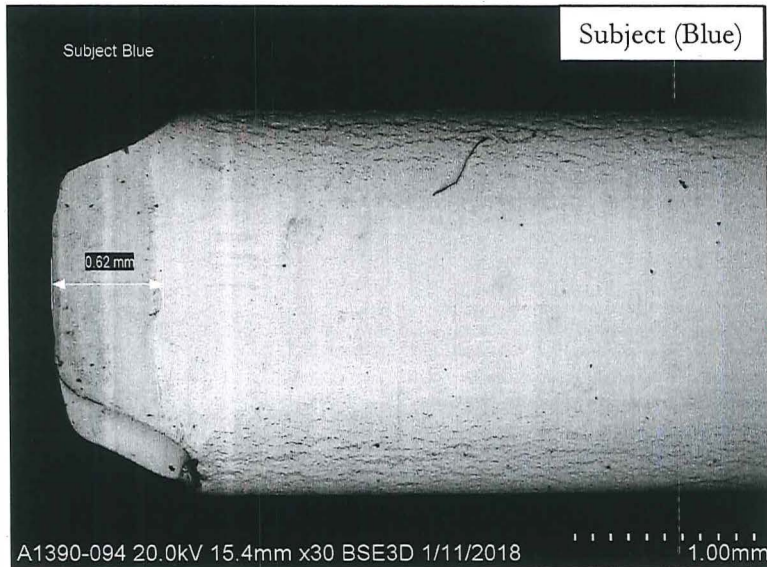


Exemplar  
Connector Blade  
(Blue)





Clarence Edward Whitaker, etc. v. Hyundai Motor Company, et al.  
Subject and Exemplar Ignition Lock Solenoid Connector Blades – Other Side



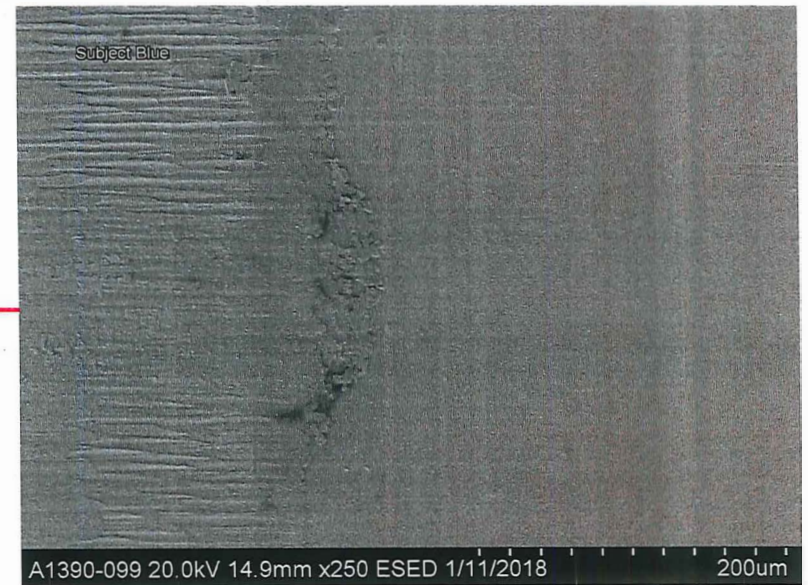
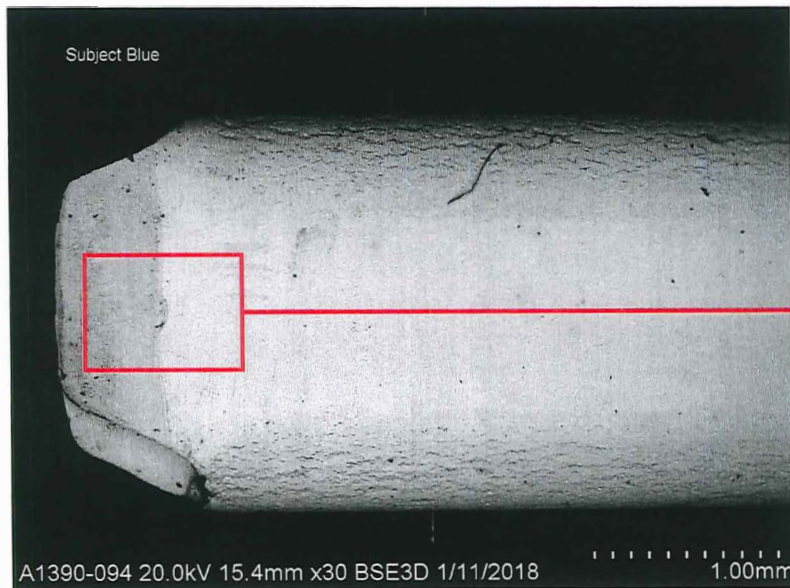
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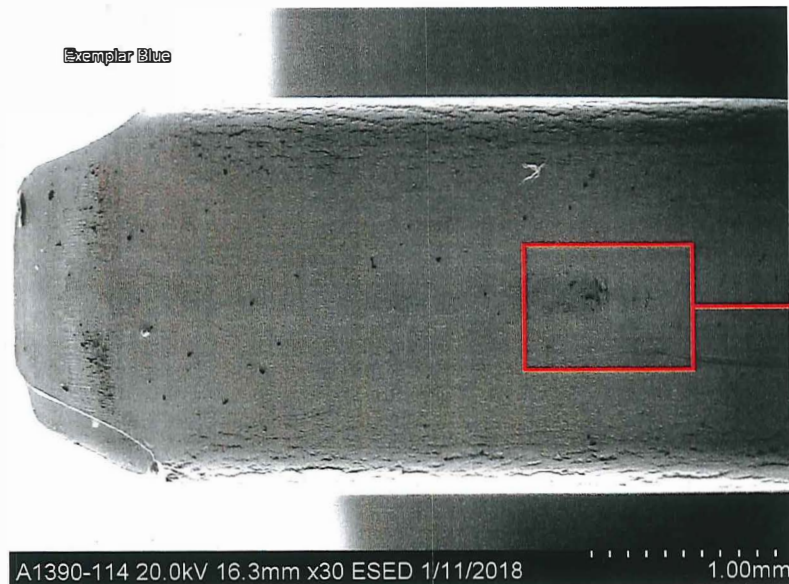


Clarence Edward Whitaker, etc. v. Hyundai Motor Company, et al.  
Subject and Exemplar Ignition Lock Solenoid Connector Blades – Other Side

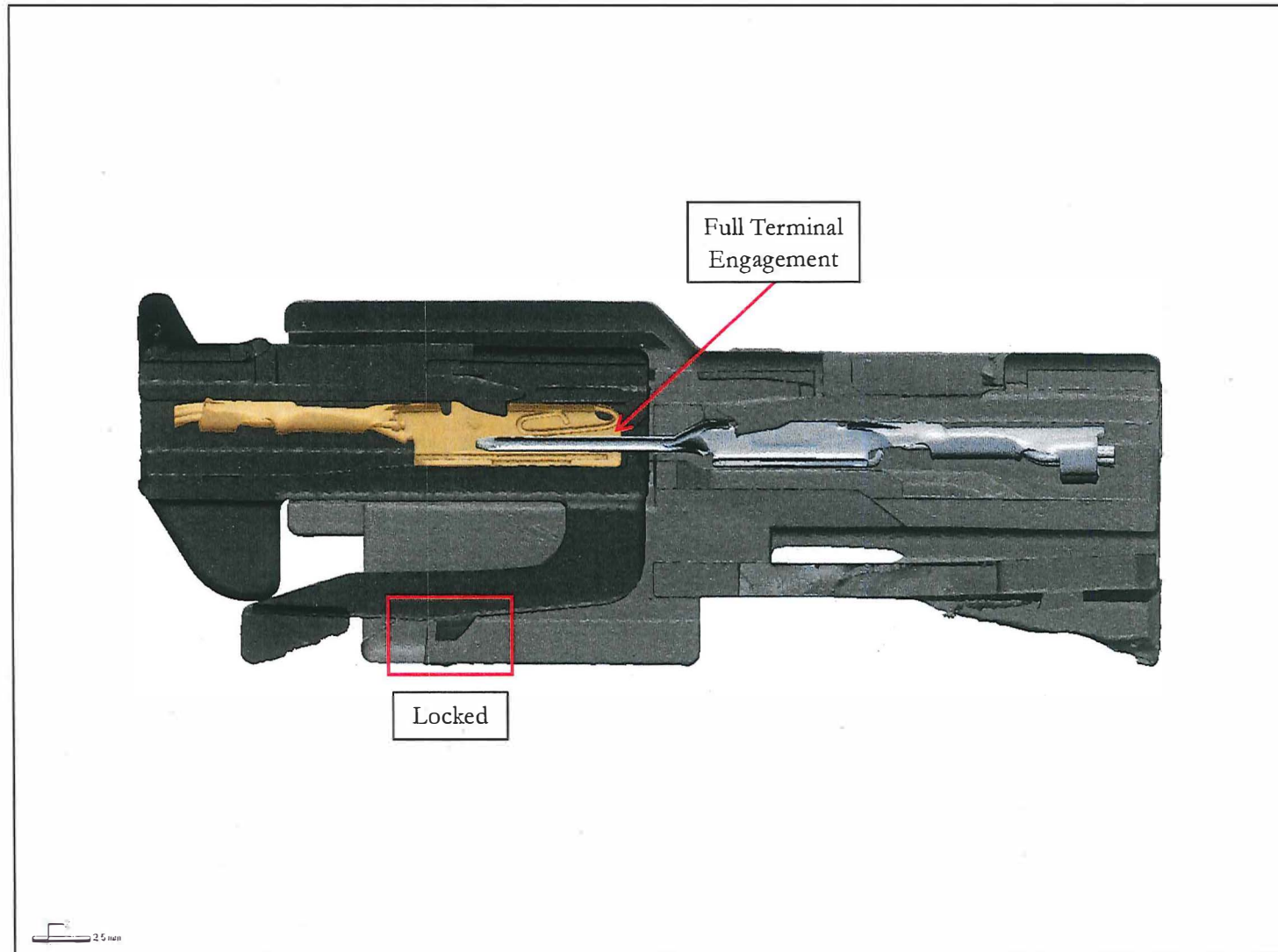
Subject  
Connector Blade  
(Blue)



Exemplar  
Connector Blade  
(Blue)

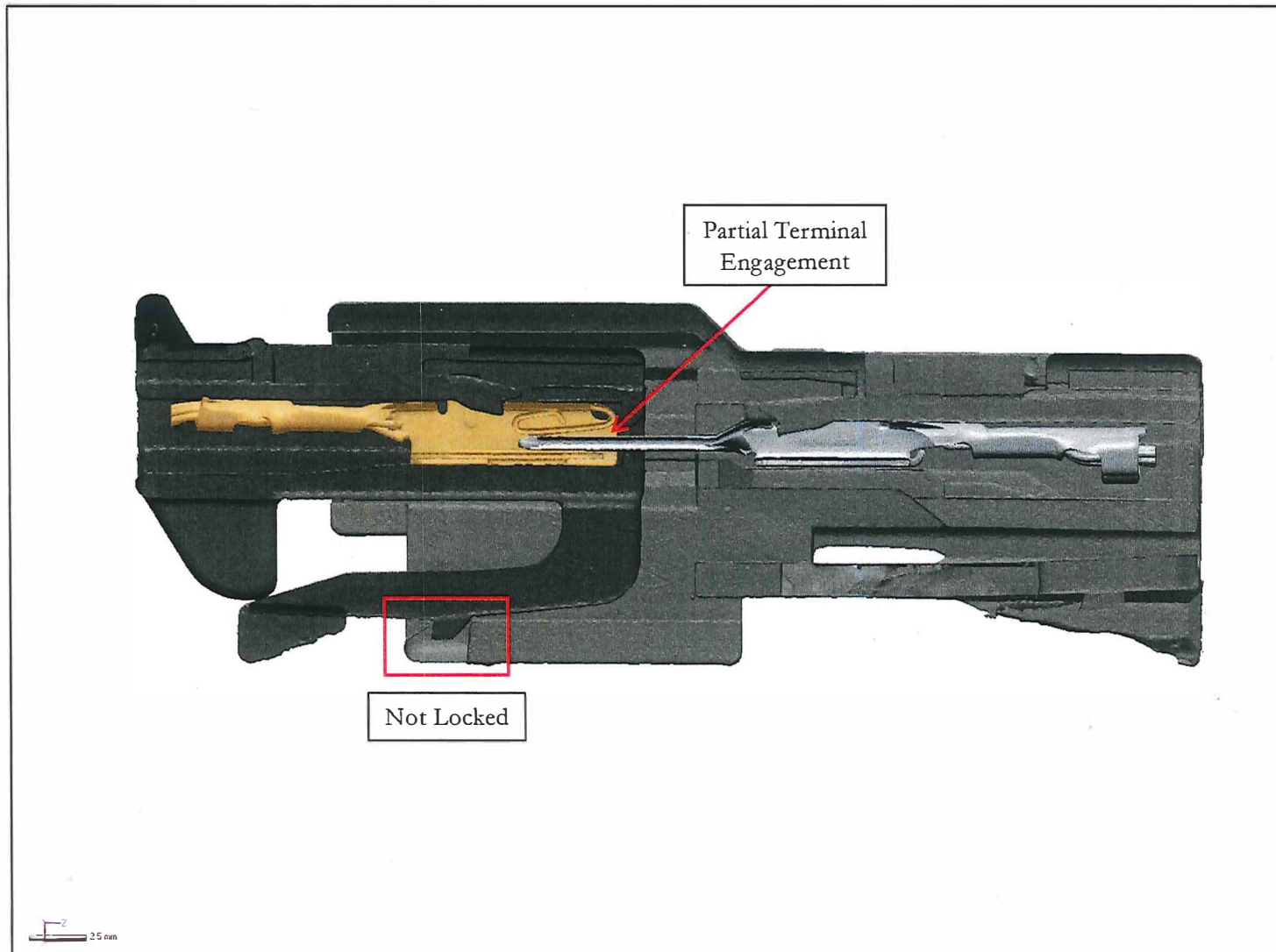


Clarence Edward Whitaker, etc. v. Hyundai Motor Company, et al.  
Fully Engaged Connector

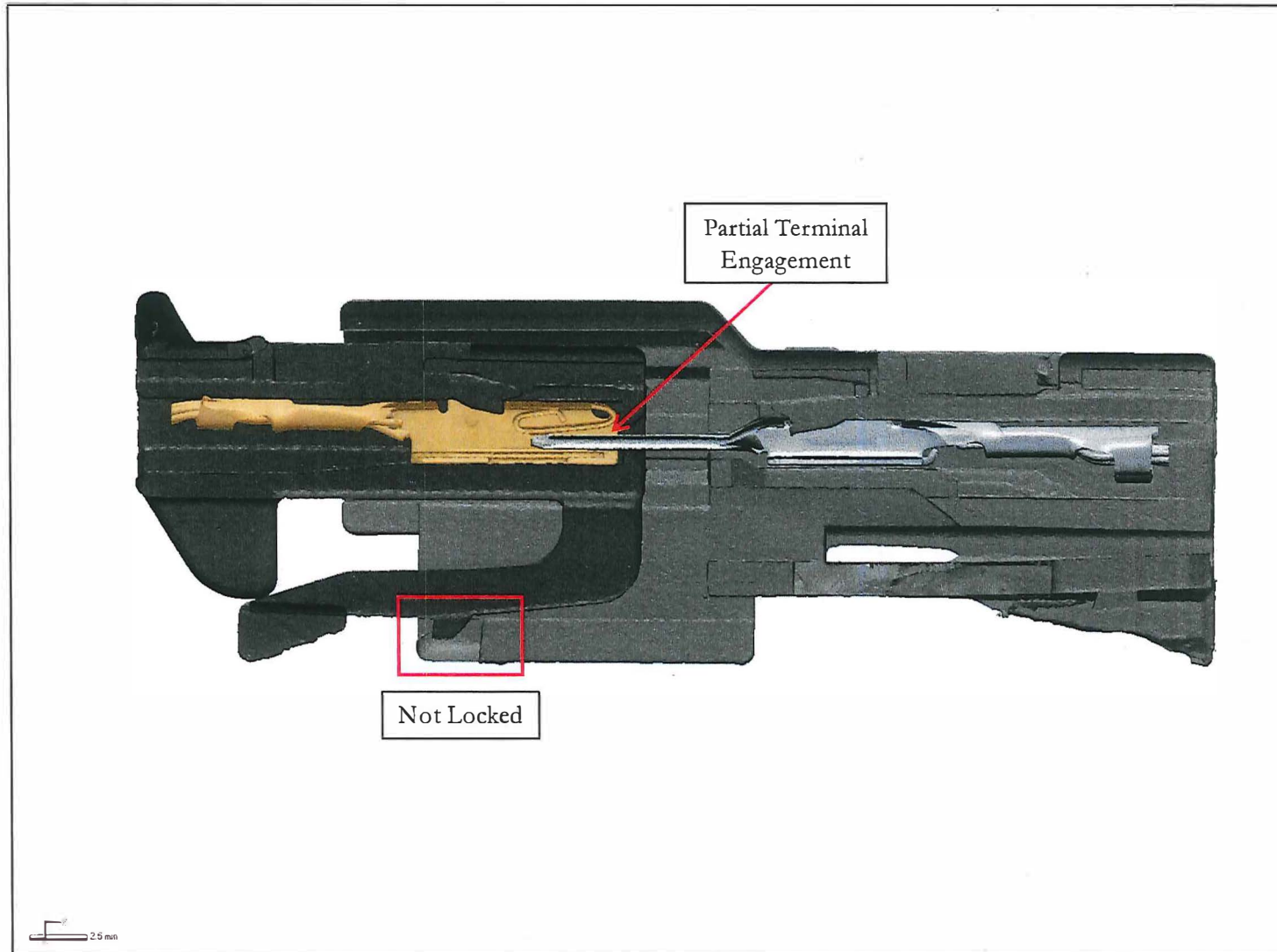




Clarence Edward Whitaker, etc. v. Hyundai Motor Company, et al.  
Engagement Minus 2.0 mm

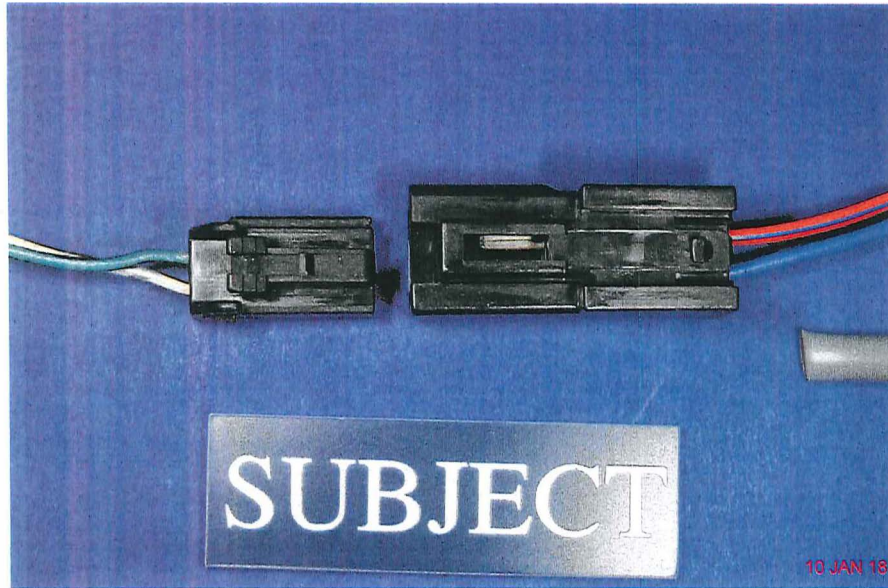


Clarence Edward Whitaker, etc. v. Hyundai Motor Company, et al.  
Engagement Minus 2.5 mm





Clarence Edward Whitaker, etc. v. Hyundai Motor Company, et al.  
Subject Ignition Lock Solenoid Connector



DP-0468

Lens: Z20:X20

Subject Connector



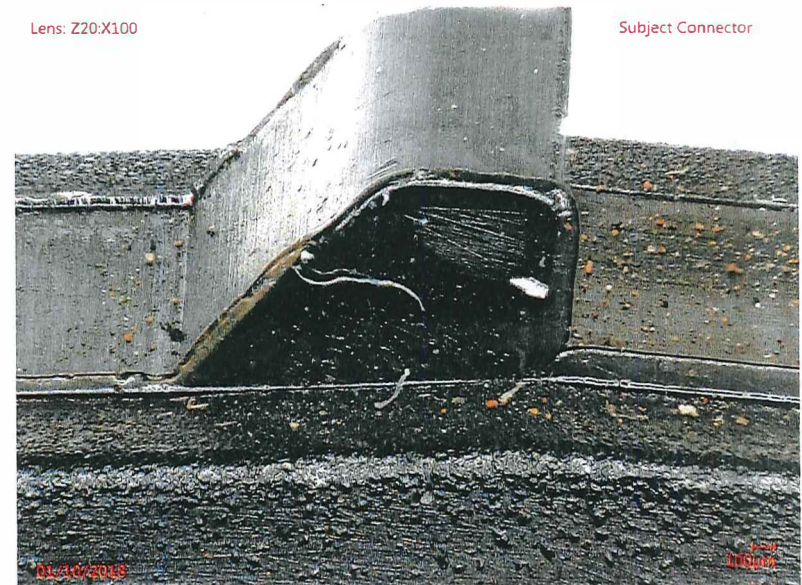
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Lens: Z20:X100

Subject Connector



KMDP-037

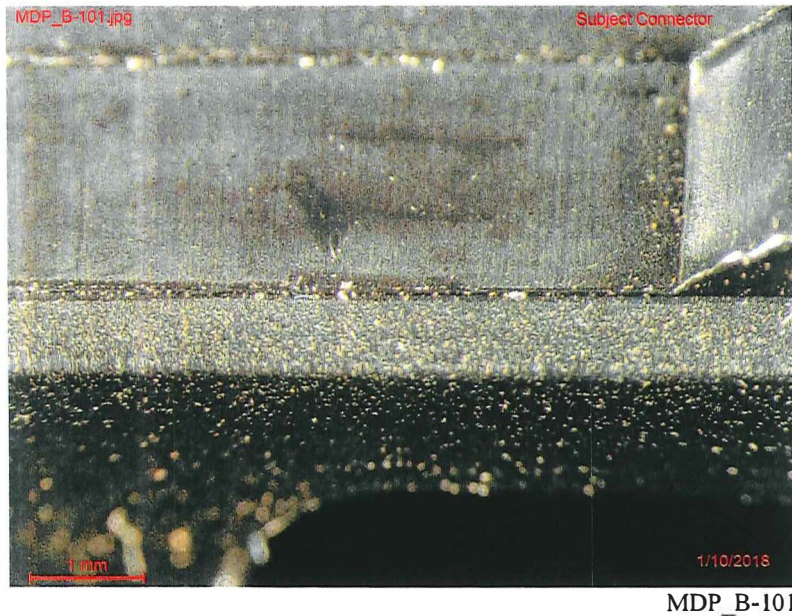
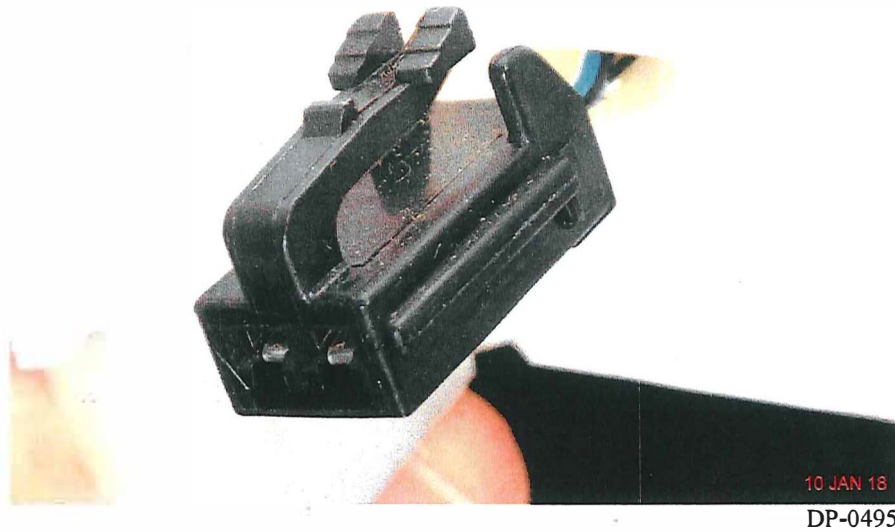


KMDP-039





Clarence Edward Whitaker, etc. v. Hyundai Motor Company, et al.  
Subject Ignition Lock Solenoid Connector



Clarence Edward Whitaker, etc. v. Hyundai Motor Company, et al.  
Subject Transmission Gear Shifter Force Evaluation

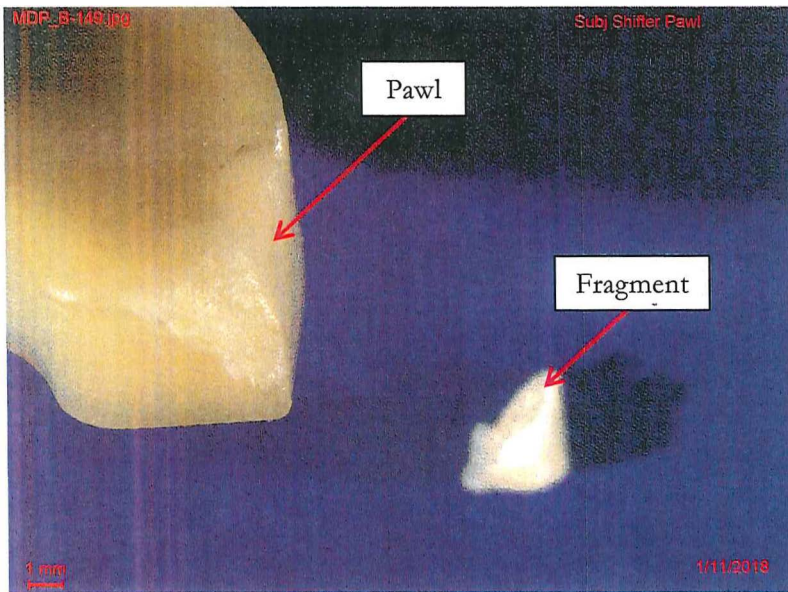
Connector Engaged (Simulated) and Key Out of Ignition (Battery Connected/Brake Not Pressed)			
Force Direction	Peak Force Observed (lbf)	Notes:	
Lateral	approximately 2.5-3 lbf	Shifter did not return to start position	0.20 lbf to return to start position
Lateral	approximately 2.5-3 lbf	Shifter did not return to start position	0.15 lbf to return to start position
Longitudinal with Shifter Held in Lateral Position	20.39	Moved to position between REVERSE and NEUTRAL	Was able to push the shifter back to the PARK position without key and brake
Longitudinal with Shifter Held in Lateral Position	21.77	Moved to NEUTRAL Position	Key and brake required to move shifter back to PARK position
Longitudinal	31.56	No rearward movement of shifter	
Longitudinal	30.35	No rearward movement of shifter	
Approx. 45 deg from Logitudinal Toward B-Pillar	29.66	No movement of shifter	Ziptie Broke
Approx. 45 deg from Logitudinal Toward B-Pillar	32.05	No movement of shifter	
Connector Engaged (Simulated) and Key Out of Ignition (Battery Connected/Brake Pressed)			
Force Direction	Peak Force Observed (lbf)	Notes:	
Lateral	approximately 2.5-3 lbf	Shifter did not return to start position	0.23 lbf to return to start position
Lateral	approximately 2.5-3 lbf	Shifter did not return to start position	0.28 lbf to return to start position
Longitudinal with Shifter Held in Lateral Position	12.79	Moved to position between REVERSE and NEUTRAL	
Longitudinal with Shifter Held in Lateral Position	19.51	Moved to position between REVERSE and NEUTRAL	
Longitudinal	27.91	No rearward movement of shifter	Ziptie broke
Longitudinal	30.61	No rearward movement of shifter	
Approx. 45 deg from Logitudinal Toward B-Pillar	31.02	No movement of shifter	
Approx. 45 deg from Logitudinal Toward B-Pillar	29.50	No movement of shifter	Ziptie broke



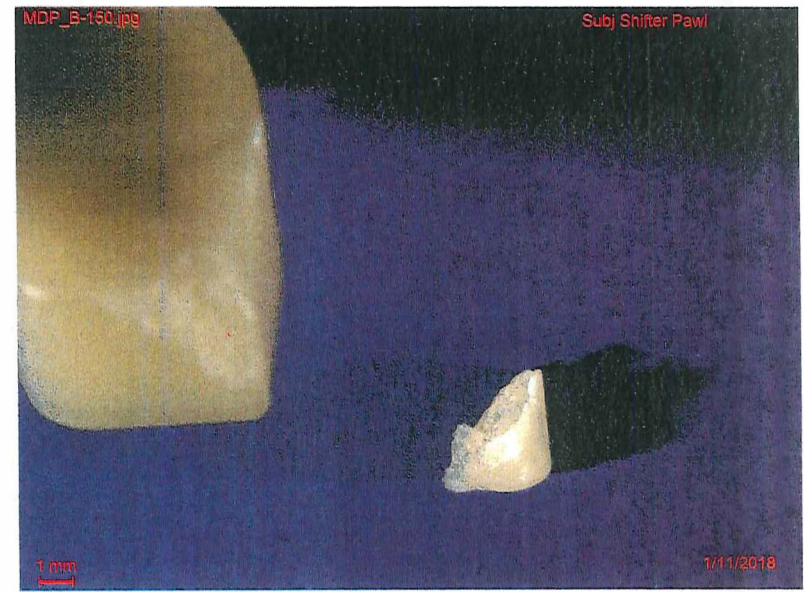


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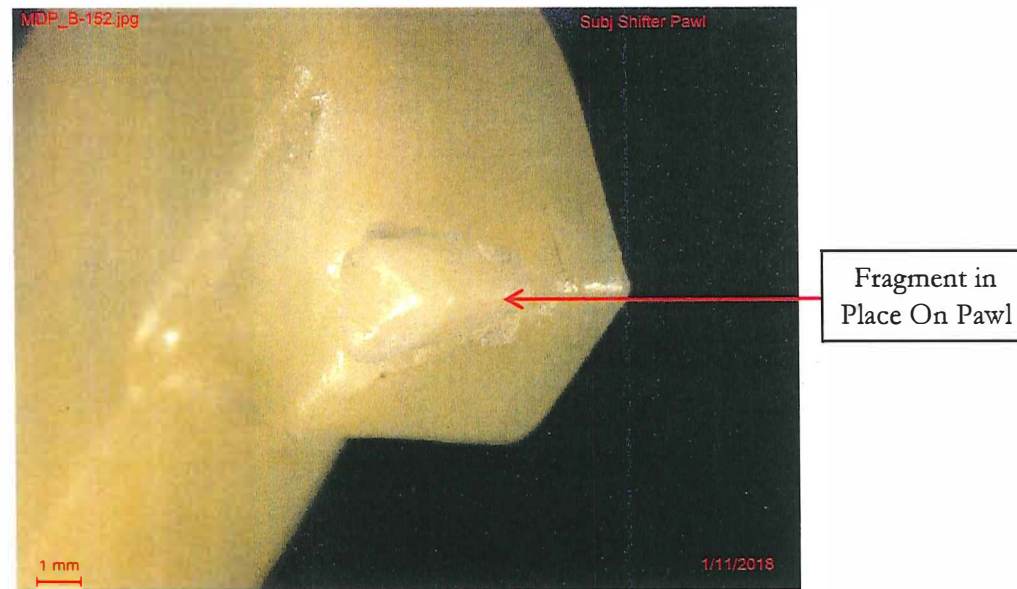
Subject Fragment Retrieved Below Shifter



MDP\_B-149



MDP\_B-150



MDP\_B-152

